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**Forest
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Southwestern
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# Forest Pest Management Report

R-3 84-9

BIOLOGICAL EVALUATION
Spruce Beetle
Population Trend and Timber Resource Losses

Fort Apache Indian Reservation
Arizona

February 1984

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USDA Forest Service, Southwestern Region
State and Private Forestry
Forest Pest Management
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## INTRODUCTION

The spruce beetle, Dendroctonus rufipennis (Kirby), continues to cause extensive mortality to Engelmann spruce on portions of the Fort Apache Indian Reservation. This current outbreak was initially detected in the spring of 1981. In both 1981 and 1982, Forest Pest Management (FPM) evaluated this spruce beetle situation (Ragenovich 1982, Linnane 1983). These evaluations describe the situation during their respective years. In 1982, the volume losses to spruce beetle were estimated to fall between 97.0 to 122.7 MMBF, with additional spruce mortality predicted (Linnane 1983).

A special task force assembled by the Bureau of Indian Affairs (BIA) studied this problem early in 1983 (Anonymous 1983). This study estimated future gross revenue losses resulting from the outbreak at $41 million for currently merchantable sawtimber and $16 million in growing stock (less than 11 inches d.b.h.). Considering these values, the BIA requested another evaluation of the spruce beetle situation. With the BIA's cooperation and participation, this survey was undertaken in the fall of 1983.

The intent of this evaluation was (1) to estimate the number and volume of currently attacked trees, (2) predict the infestation trend, and (3) provide management alternatives and recommendations. Survey data were collected by FPM and BIA personnel during September 12-22, 1983.

## TECHNICAL INFORMATION

Insect. Spruce beetle, Dendroctonus rufipennis (Kirby)

Host. Engelmann spruce, Picea engelmannii Parry

Life History and Evidence of Infestation. Schmid and Frye (1977) and Massey and Wygant (1954) describe the spruce beetle life cycle and behavior in detail. Briefly, Dendroctonus rufipennis predominantly has a 2-year life cycle, although 1- and 3-year life cycles have been described. Adult D. rufipennis usually attack host trees during May, June, and possibly early July. Egg gallery construction and oviposition continue through the summer. Immature larvae are present by October and overwinter. Larvae resume feeding in spring and develop to pupae before late summer. Pupae transform to adults which overwinter a second time. These insects emerge in the late spring to attack new host material.

Spruce beetles generally prefer to attack green windthrown or other recently downed spruce. As a result, endemic beetle populations are always present, breeding in scattered down material, in the spruce-fir forest type. Outbreaks generally begin after a major forest disturbance (i.e., a large windthrow) creates an abundance of suitable breeding material. Beetle populations rapidly increase in the down material and then readily attack standing spruce. Under favorable conditions, outbreaks may persist until suitable host material is depleted. On occasion, unfavorable climatic conditions, principally extreme cold, cause outbreaks to collapse.

Spruce beetle outbreaks are difficult to detect. Tree crowns fade approximately 1 year after attack; however, discolored needles may remain on twigs for only a short duration, making recently attacked trees difficult to separate from snags. Newly attacked trees can often only be detected by close examination for boring dust. Pitch tubes may or may not be readily visible.

History of Spruce Beetle on the Fort Apache Indian Reservation. Ragenovich (1982) summarized the history of spruce beetle on the Fort Apache Indian Reservation as follows: "Large areas of spruce mortality were first detected in the White Mountains of the Fort Apache Indian Reservation in 1904. This mortality was most likely the result of spruce beetle activity. The first recorded spruce beetle outbreak occurred from 1948 to 1952, when an estimated 22 percent of the spruce was killed in the Ord Creek drainage. The next recorded outbreak occurred from 1968 to 1971 when beetle populations built up in down material and spread to standing green trees, killing tens of thousands of trees in five drainages. The outbreak subsided abruptly in 1971 when record-low temperatures caused high larval mortality."

Location and Extent of the Current Outbreak. This outbreak was initially detected in 1981. Subsequently, attacked trees have been detected throughout the spruce-fir type on reservation lands including the Mount Baldy Wilderness Area (figure 1). There are approximately 38,600 acres of type on the reservation. In 1982, an aerial detection survey estimated 100,000 fading spruce in this zone. The detection survey in 1983 estimated over 200,000 fading spruce, with approximately 75,000 of these trees occurring within the wilderness area. Outside the wilderness, the spruce-fir type has been divided into five management compartments. In 1983, Burnt Mountain and Bull Cienega compartments had high concentrations of fading spruce, while, Diamond Butte, Tiger Butte, and Mount Ord compartments had fewer fading spruce than in the previous year. Spruce beetle activity also increased on adjacent lands within the Apache-Sitgreaves National Forests, principally in the Mount Baldy Wilderness Area.

Host Stand Condition. Infested stands are predominately spruce (approximately 60 percent of basal area); other principal species are corkbark fir, Abies lasiocarpa var arizonica (Merriam) Lemm., aspen, Populus tremuloides Mich., and Douglas-fir, Pseudotsuga menziesii (Mirb.) Franco. Average diameter of live spruce is now approximately 15 inches. Stand basal areas range from 170 to 200 square feet per acre. Standing infested and dead spruce are abundant in many areas, as well as down spruce from past spruce beetle outbreaks.

The 1982 biological evaluation (Linnane 1983) estimated average current attacked spruce at 2.6 trees per acre. Also, estimates on beetle-killed spruce basal area to date ranged between 17.4 and 29.8 percent. Volume losses were placed between 97.0 and 122.7 MMBF.

## METHODS

Survey Design. A systematic variable plot cruise following a stratified random sampling design was used to estimate tree losses and beetle activity in the five management compartments. Stratification of currently fading spruce was accomplished utilizing an aerial sketch map. The sketch map provided the locations and intensities of 1982 spruce beetle attacks. From this information, spruce beetle activity was delineated into three strata; low (<1 fader per acre), moderate (>1 <3 faders per acre), and heavy (>3 faders per acre). An estimate of sample size for the tree strata was determined using a method described by Freese (1974). Using proportional allocation, the approximate sample size to achieve an accuracy of ± 0.8 attacked trees per acre at the 0.05 probability level is estimated by:

$$N = \frac{N(\Sigma N_h s_h^2)}{\frac{N^2 E^2}{4} + \Sigma N_h s_h^2}$$

Where: $N$ = area sample
$N_h$ = stratum size
$s_{h_2}$ = within stratum variance
$E_h$ = desired error

Strata variance estimates were derived from the 1982 survey. Table 1 presents compartment and strata sizes, and estimated number of samples.

Cruise lines were located in cardinal directions across contour at 20-chain intervals over the entire spruce-fir forest type in each compartment. Variable point sample plots were located along cruise lines at 5- to 10-chain intervals, depending on required sampling intensity for the various strata. Variable point sampling was accomplished using a 30 BAF prism.

Data Collection. All sample trees were tallied by species and diameter. Spruce was classed in one of five damage categories based on beetle activity: (1) green--uninfested spruce; (2) 1983 attacks--parent adults, eggs, or small larvae present; (3) 1982 attacks--fading foliage and large larvae, pupae, or adults present; (4) old attacks--no spruce beetle present and foliage mostly dropped; (5) partial attack--beetle attacks limited to one side of bole and foliage green.

Data Analysis. Data were compiled and analyzed using the "PEST" program at the Fort Collins Computer Center. This program provides the average trees per acre and basal area per acre estimates by damage categories, with standard deviation and standard error estimates.

For the various strata, estimates of means and standard errors were computed using methods described by Freese (1962). Trees per acre and basal area estimates for the management compartments were computed by expanding strata estimates proportional to stratum size within the compartment.

Volume estimates were computed by the BIA. Board-foot estimates were made for trees 12 inches or greater in diameter. Cubic-foot estimates were made for trees less than 12 inches in diameter.

## RESULTS

Sampling Intensity. A systematic variable plot cruise was completed on 20,082 acres of spruce-fir forest type outside of the Mount Baldy Wilderness Area. A total of 694 samples points were measured in the 3 strata. Stratum 1 (low) contained 460 plots; stratum 2 (moderate) contained 95 plots; and stratum 3 (high) contained 139 plots.

Tree Losses. Estimates of spruce beetle-attacked trees along with nonhost tree estimates for the strata are presented in tables 2 and 3. Tree losses (total attacks including partial attacks) ranged from 16.6 trees per acre in the low stratum to 24.7 trees per acre in the moderate stratum (table 2). The mean for all strata was 17.4 trees per acre, with a standard error estimate of 7 percent.

Estimates for numbers of currently attacked spruce for the low, moderate, and high strata were 1.2, 2.2, and 1.6 trees per acre, respectively. The mean for all strata was 1.3 trees per acre, with a standard error estimate of 23 percent.

Basal area estimates for all beetle-attacked spruce (including partial attacks) ranged from 23.3 square feet per acre in the low stratum to 35.4 square feet per acre in the high stratum (table 3). The mean for all strata was 26.0 square feet per acre, with a standard error estimate of 5 percent. Survey data indicated 15.8, 22.4, and 27.4 percent of the spruce basal area for the low, moderate, and high strata, respectively, has been attacked by spruce beetles.

Table 4 presents basal area and trees per acre estimates for green and beetle-attacked spruce for the management compartments by calculating weighted averages of the strata estimates for each compartment. For 1983 beetle-attacked spruce, estimates ranged from a low of 1.2 trees per acre in the Sunrise compartment to a high of 1.4 trees per acre in both the Mount Ord and Bull Cienega compartments.

Gross Volume Losses. Table 5 presents gross volume estimates for green and beetle-infested spruce, corkbark fir, Douglas-fir, aspen, and other tree species for the various compartments. These volume estimates were based on the stratified cruise data. For spruce 12 inches d.b.h. and larger, the gross volume of all categories of infested trees ranged from 3.53 MBF per acre in the Sunrise compartment to 4.49 MBF per acre in the Burnt Mountain compartment. Based on total compartment acreages (20,082 acres), 82.8 MMBF of spruce has been attacked by spruce beetle. This estimate is lower than the 1982 estimate of 97 to 122 MMBF (Linnane 1983) due primarily to a refinement of total spruce-fir acreage estimates excluding nonforested acreage, the salvage of approximately 15 MMBF during the past year, and the fact that the current estimate includes only spruce 12 inches d.b.h. and larger. Sampling error is also a factor.

Stand Structure and Composition. Spruce beetle infested stands within areas surveyed average approximately 196 square feet of basal area per acre. Seventy-three percent of the overstory basal area is spruce. Other major tree species present include corkbark fir (b.a. = 26.5 square feet per acre), Douglas-fir (b.a. = 14.6 square feet per acre), and aspen (b.a. = 11.7 square feet per acre).

Tables 6 through 17 present population stand table data for host and nonhost tree species by the various strata. From this data, there are approximately 73, 63, and 60 standing spruce per acre larger than 12 inches d.b.h. in the low, moderate, and high strata, respectively. Of these trees, approximately 15.4, 21.9, and 25.9 percent (>12 inches d.b.h.) have been attacked by spruce beetle thus far in the outbreak. The residual green spruce above 12 inches d.b.h. is estimated at 62, 49, and 44 trees per acre for the low, moderate, and high strata, respectively. The average diameter of green spruce (>5 inches d.b.h.) in all strata is 15.3 inches.

Infestation Trend. Using the stratified cruise data, the overall ratio of current (1983) to the previous year's (1982) spruce beetle attacks is 1.2, indicating a slight increasing trend, assuming beetle generations are fully overlapping and at approximately equal population levels. However, there is little evidence to support this assumption.

Assumming the majority have a 2-year life cycle, we can compare actual beetle generations. The 1982 survey (Linnane 1983) estimated a mean of 1.7 trees per acre attacked in 1981. If the 1983 attacks are compared to the 1981 estimate (the previous generation), the overall ratio is 0.8, indicating a slight decreasing trend. Examining this trend in depth, the low strata 1983 to 1981 ratio is 1.5; the moderate and high strata 1983 to 1981 ratios are 0.8 and 0.7, respectively.

Comparing actual generations, the data indicate fewer attacks or a decreasing trend in the moderate and high strata and more attacks or an increasing trend in the low stratum. These trends are verified somewhat when examining tables 1 and 4. The Sunrise compartment, which is entirely within the low stratum, showed the greatest increase in frequency of beetle attack (0.8 trees per acre in 1982 and 1.2 trees per acre in 1983), while the Mount Ord compartment, which was heavily attacked in previous years (Linnane 1983), showed the greatest decline (2.1 trees per acre in 1982 to 1.4 trees per acre in 1983).

## DISCUSSION

Survey results indicate spruce beetle populations remained at epidemic levels in the spruce-fir type during 1983. However, the frequency of new attacks has declined over previous years. For 1984, the frequency of new attacks is expected to decline from the 1982 levels (2.6 trees per acre), but should remain near the 1983 level, at least above 1 tree per acre. Spruce beetle activity should decrease in areas heavily infested during the past few years (i.e., those areas identified as high or moderate strata during this and the 1982 survey) and may increase slightly in areas identified as low strata in the survey.

As expected, the spruce beetle's greatest impact has been in high basal area stands containing large diameter trees. These type stands are the most susceptible and vulnerable (Schmid and Frye 1976). However, intermediate diameter class trees are currently maintaining the outbreak in many locations. This fact was also reported by Frye and Flake (1972) during a survey of many of the same areas on Fort Apache Indian Reservation.

As stated in prior evaluations (Linnane 1983), the end result of this spruce beetle outbreak will be reductions in total stand basal areas to possibly less than 125 square feet per acre, with the depletion of a high percentage of large diameter spruce. The percent basal area in nonhost trees will increase. This prediction can be verified somewhat by existing data. Between 1968 and 1971, a spruce beetle outbreak occurred in many of the same areas currently infested. During January 1971, an extreme cold period drastically reduced beetle populations (Frye 1971) and the outbreak subsided. However, an extensive cruise was completed in the fall of 1971 (Frye and Flake 1972). Data from this 1971 survey and the 1983 survey are comparable for the Bull Cienega, Diamond Butte, and Mount Ord compartments. Figures 2 through 4 compare stand basal area prior to 1971 and in 1983[1] for these compartments. The general trend over the last 12 years has been a decline in total stand basal area through reduction of the spruce component. While logging may have accounted for some spruce removal, spruce beetle-caused mortality was the principal factor. This trend is expected to continue as long as epidemic levels of spruce beetle exist.

During the survey, it was possible to observe many heavily damaged spruce stands. From these observations, it became evident that most stands contained adequate amounts of spruce reproduction to assure continued spruce dominance of the site. Miller (1970), studying a massive spruce beetle epidemic on the White River Plateau, Colorado, theorized periodic spruce beetle epidemics were an important natural process in maintaining spruce-fir stands in the central Rocky Mountains; these epidemics serving as an ecological trigger for spruce reproduction. The result being the creation of two-storied stands rather than the expected uneven-aged stands. The spruce beetle may be performing this same function on Fort Apache Indian Reservation lands.

## ALTERNATIVES

The following alternatives and their components are presented for consideration:

1. No Action. This alternative allows the spruce beetle outbreak to continue, regulated only by natural factors. The outbreak will eventually subside as a result these natural factors which include host depletion, predation, and climate. No direct action is

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[1] These stand basal area estimates were computed by the BIA, and differ slightly from estimates in table 4.

taken against the insect. However, logging to capture the value of damaged timber should be undertaken as described in the following components. These actions will have little or no effect on the progress of the outbreak.

a. Salvage Logging. This action involves logging of highly vulnerable, infested, and dead trees. Large diameter uninfested trees, along with infested and dead material, are felled and transported to millsites. The intent is to maximize utilization while possibly reducing stand vulnerability.

b. Presalvage Logging. This action is a variant of salvage logging designed to utilize susceptible trees. Presalvage involves cutting merchantable trees in anticipation of losses that are likely to occur before definitive regeneration cuts are made to replace the stands (Smith 1962). Under this alternative, stands would be entered and susceptible spruce, principally large diameter, would be removed prior to attack by the spruce beetle. The principal advantage of presalvage over salvage is the market value of the material removed. Green, unifested spruce should have a higher dollar value than dead, infested spruce subjected to spiral checking and other degrades. Clearcutting or partial cutting harvesting methods may be appropriate.

2. Direct Suppression. Under this alternative, direct action is taken to suppress the outbreak. There are several suppression tactics which are described as the following components:

a. Treatment of Individual Infested Trees. This action involves treating infested trees by (1) applying an insecticide, (2) felling and burning, or (3) felling and debarking. The objective, in all cases, is to destroy the developing insect brood. To be effective, a high percentage (>90 percent) of infested trees must be located and treated. In large infestations, this is difficult to impossible.

b. Trap Trees. Under this alternative, uninfested merchantable trees are felled prior to beetle flight. These trees are more attractive to beetles than standing trees and, hence, lure beetles away from standing timber. To be effective, trap trees must be felled in accessible areas to simplify removal. They must be removed or treated prior to the next beetle flight. While the trap-tree approach may be effective on infestations of limited size, it is doubtful any benefit could be derived when used against extensive infestations.

A variation of trap trees is lethal trap trees. Prior to felling, these trees are injected with silvicides. Brood development in these trees is unsuccessful. Lethal trap trees do not necessarily have to be removed.

3. Preventive Insecticidal Spray. The insecticide carbaryl when applied to the bole of bark beetle host trees prevents successful attack by these insects. The preventive spray strategy involves

selecting individual high-value trees, such as along ski trails or around developed recreation sites, and applying carbaryl prior to beetle flight. This strategy has been successfully used against the mountain pine beetle and certain Ips beetles in ponderosa and lodgepole pines. However, little information is available on its effectiveness against the spruce beetle.

## RECOMMENDATIONS

No action is the recommended alternative for the current outbreak. As described under this alternative, salvage logging and presalvage logging should be continued as a means of reducing dollar losses to the outbreak. Again, these logging operations will have little overall effect on spruce beetle populations.

In designing salvage or presalvage operations, residual stand windfirmness is an important consideration. Also, any logging operations should be closely monitored to insure a minimum of logging debris remains. Stump height should be kept below 1.5 feet. Cull logs and tops should be bucked into short lengths and scattered laying on the ground in open areas. Log decks containing infested material should be removed to millsites prior to beetle flight.

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TABLE 1.--Compartment and strata size, and estimated number of samples required for the 1983 spruce beetle survey, Fort Apache Indian Reservation

| Compartment | Strata | | | | | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | Low | | Moderate | | Heavy | | | |
| | Acreage | Samples[1] | Acreage | Samples[1] | Acreage | Samples[1] | Acreage | Samples[1] |
| Diamond Butte | 2,604 | 73 | 306 | 10 | 573 | 15 | 3,483 | 98 |
| Mount Ord | 4,362 | 123 | 695 | 22 | 1,339 | 35 | 6,396 | 180 |
| Bull Cienega | 3,112 | 87 | 594 | 19 | 304 | 8 | 4,010 | 114 |
| Sunrise | 2,819 | 79 | 0 | 0 | 0 | 0 | 2,819 | 79 |
| Burnt Mountain | 2,225 | 63 | 34 | 1 | 1,115 | 30 | 3,374 | 94 |
| Totals | 15,122 | 425 | 1,629 | 52 | 3,331 | 88 | 20,082 | 565 |

[1] Samples required to achieve an accuracy of ± 0.8 attacked trees per acre at the 0.05-probability level.

TABLE 2.--Trees per acre by species and damage class for the sampling strata, Fort Apache Indian Reservation

| Strata | Engelmann Spruce | | | | | | | | | | | | | | True fir | | Douglas-fir | | Aspen | | Total nonhost | | Total all species | | % spruce |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Green | | Attacked 1982 | | Attacked 1983 | | Partial attacks | | Old attacks | | Total attacks | | | Total spruce | | | | | | | | | | | |
| | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | % | T.A. | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | T.A. | (S.E.) | |
| Low | 158.8 | (7.3) | 0.8 | (0.2) | 1.2 | (0.3) | 3.4 | (0.3) | 13.2 | (1.6) | 16.6 | (1.7) | 9.5 | 175.4 | 61.8 | (5.5) | 9.5 | (1.6) | 20.8 | (3.6) | 92.2 | (6.7) | 267.7 | (9.8) | 65.5 |
| Moderate | 143.5 | (13.0) | 3.7 | (1.3) | 2.2 | (0.9) | 2.6 | (1.3) | 16.2 | (3.4) | 24.7 | (4.4) | 14.7 | 168.2 | 39.9 | (11.5) | 4.9 | (1.9) | 32.2 | (12.0) | 77.5 | (16.3) | 245.7 | (23.0) | 68.5 |
| High | 114.9 | (11.2) | 1.2 | (0.4) | 1.6 | (0.8) | 1.6 | (0.5) | 13.1 | (2.0) | 17.5 | (2.3) | 13.2 | 132.4 | 29.1 | (5.4) | 8.6 | (2.2) | 8.2 | (4.0) | 46.4 | (6.9) | 178.9 | (14.0) | 74.0 |
| Mean | 150.3 | (5.8) | 1.1 | (0.2) | 3.0 | (0.2) | 1.3 | (0.3) | 13.4 | (1.2) | 17.4 | (1.3) | 10.4 | 167.7 | 54.6 | (4.3) | 9.0 | (1.2) | 19.6 | (2.9) | 83.4 | (5.2) | 251.2 | (7.8) | 66.8 |

TABLE 3.--Basal area by tree species and damage class for the sampling strata, Fort Apache Indian Reservation

| Strata | Engelmann Spruce | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Green | | Attacked 1982 | | Attacked 1983 | | Partial attacks | | Old attacks | | Total attacks | | | Total spruce | True fir | | Douglas-fir | | Aspen | | Total nonhost | | Total all species | % spruce |
| | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | % | B.A. | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | B.A. | (S.E.) | | |
| Low | 124.0 | (4.1) | 1.6 | (0.3) | 1.6 | (0.5) | 2.5 | (0.5) | 17.6 | (1.5) | 23.3 | (1.9) | 15.8 | 147.3 | 29.3 | (2.1) | 15.8 | (1.7) | 12.3 | (1.7) | 57.7 | (3.4) | 204.7 | 72.0 |
| Moderate | 111.8 | (8.4) | 6.0 | (2.2) | 2.5 | (0.9) | 3.8 | (1.3) | 19.9 | (4.0) | 32.2 | (5.6) | 22.4 | 144.0 | 22.1 | (4.9 ) | 9.8 | (3.2) | 18.3 | (5.6) | 50.8 | (8.4) | 194.2 | 74.2 |
| High | 91.9 | (6.7) | 2.4 | (0.8) | 2.8 | (1.1) | 3.4 | (0.9) | 26.8 | (3.6) | 35.4 | (4.1) | 27.8 | 127.3 | 16.4 | (2.5) | 11.4 | (2.4) | 5.6 | (2.2) | 33.4 | (4.3) | 160.7 | 79.2 |
| Mean | 177.7 | (9.8) | 2.1 | (0.3) | 1.9 | (0.4) | 2.7 | (0.4) | 19.3 | (1.3) | 26.0 | (1.6) | 18.0 | 143.715 | 26.5 | (2.7) | 14.6 | (1.9) | 11.7 | (2.0) | 53.1 | (7.2) | 196.5 | 73.1 |

TABLE 4.--Basal area per acre and trees per acre for spruce by damage class in the various management compartments[1]

| Damage class | Diamond Butte | | Mount Ord | | Bull Cienega | | Sunrise | | Burnt Mountain | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B.A. | T.A. | B.A. | T.A. | B.A. | T.A. | B.A. | T.A. | B.A. | T.A. |
| Spruce | | | | | | | | | | |
| Green | 104.0 | 150.2 | 115.9 | 147.9 | 119.8 | 153.2 | 124.0 | 158.8 | 113.3 | 144.1 |
| Attacked 1982 | 2.1 | 1.1 | 2.2 | 2.1 | 2.3 | 1.3 | 1.6 | 0.8 | 1.9 | 1.0 |
| Attacked 1983 | 1.9 | 1.3 | 1.9 | 1.4 | 1.8 | 1.4 | 1.6 | 1.2 | 2.0 | 1.3 |
| Partial attack | 2.8 | 3.0 | 2.8 | 4.4 | 2.8 | 3.1 | 2.5 | 3.4 | 2.8 | 2.8 |
| Old attacks | 19.3 | 13.4 | 19.8 | 14.4 | 18.6 | 13.6 | 17.6 | 13.2 | 20.7 | 13.2 |
| Total attacks | 20.2 | 17.5 | 26.8 | 17.7 | 25.5 | 17.9 | 23.3 | 16.6 | 27.4 | 17.0 |
| Total spruce | 143.7 | 167.7 | 142.7 | 165.6 | 145.3 | 171.1 | 147.3 | 175.4 | 140.7 | 161.1 |

[1] Estimates based on strata means

TABLE 5.--Gross volumes per acre by compartment based on spruce beetle stratification

| Category | Management compartment | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Diamond Butte | | Mount Ord | | Bull Cienega | | Sunrise | | Burnt Mountain | |
| | MCF[3] | MBF[4] | MCF | MBF | MCF | MBF | MCF | MBF | MCF | MBF |
| Spruce | | | | | | | | | | |
| Green | 0.57 | 12.76 | 0.57 | 12.60 | 0.59 | 12.93 | 0.59 | 13.35 | 0.54 | 12.38 |
| Infested | 0.04 | 4.13 | 0.04 | 4.29 | 0.05 | 3.97 | 0.04 | 3.53 | 0.03 | 4.49 |
| Total | 0.61 | 16.89 | 0.61 | 16.89 | 0.64 | 16.90 | 0.63 | 16.88 | 0.57 | 16.88 |
| True fir | 0.23 | 1.73 | 0.22 | 1.70 | 0.24 | 1.74 | 0.26 | 1.86 | 0.22 | 1.69 |
| Douglas-fir | 0.01 | 1.96 | 0.01 | 1.90 | 0.03 | 1.96 | 0.01 | 2.16 | 0.80 | 1.92 |
| Other | 0 | 0.34 | 0 | 0.32 | 0 | 0.37 | 0 | 0.44 | -- | 0.03 |
| Aspen[1] | 0.15 | 0.19 | 0.15 | 0.19 | 0.16 | 0.20 | 0.17 | 0.22 | 0.13 | 0.19 |
| All species[2] | 1.01 | 20.82 | 0.99 | 20.74 | 1.06 | 20.86 | 1.08 | 21.16 | 0.93 | 20.71 |

[1] Aspen estimates are all cubic foot volumes.
[2] Calulated value is slightly different than the total of all categories due to rounding of decimals.
[3] Thousand cubic feet per acre.
[4] Thousand board feet per acre.

TABLE 6.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY LOW STRATA 1
HOST SPECIES IS ENGELMANN SPRUCE THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 460 PLOTS, AND
REPRESENT AN AREA OF 15122. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES

PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 15.305 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 15.305 | 8.723 |
| 6.0- 6.9 | 13.950 | .000 | .000 | .000 | .996 | .000 | .996 | 6.667 | 14.947 | 8.519 |
| 7.0- 7.9 | 18.546 | .000 | .000 | .000 | .488 | .000 | .488 | 2.564 | 19.034 | 10.849 |
| 8.0- 8.9 | 13.078 | .187 | .000 | .000 | .561 | .000 | .747 | 5.405 | 13.826 | 7.880 |
| 9.0- 9.9 | 13.286 | .000 | .000 | .000 | .886 | .000 | .886 | 6.250 | 14.172 | 8.077 |
| 10.0- 10.9 | 11.718 | .000 | .000 | .000 | 1.554 | .000 | 1.554 | 11.712 | 13.273 | 7.565 |
| 11.0- 11.9 | 11.068 | .000 | .000 | .099 | .593 | .000 | .692 | 5.882 | 11.760 | 6.702 |
| 12.0- 12.9 | 9.964 | .249 | .000 | .000 | .581 | .000 | .830 | 7.692 | 10.795 | 6.153 |
| 13.0- 13.9 | 9.410 | .071 | .071 | .142 | .495 | .000 | .778 | 7.639 | 10.189 | 5.807 |
| 14.0- 14.9 | 8.358 | .122 | .122 | .000 | 1.281 | .000 | 1.525 | 15.432 | 9.883 | 5.633 |
| 15.0- 15.9 | 6.165 | .000 | .000 | .106 | .638 | .000 | .744 | 10.769 | 6.909 | 3.938 |
| 16.0- 16.9 | 6.399 | .093 | .093 | .047 | .561 | .000 | .794 | 11.039 | 7.193 | 4.100 |
| 17.0- 17.9 | 4.469 | .124 | .207 | .290 | .703 | .000 | 1.324 | 22.857 | 5.793 | 3.301 |
| 18.0- 18.9 | 4.023 | .074 | .000 | .148 | .701 | .000 | .923 | 18.657 | 4.945 | 2.819 |
| 19.0- 19.9 | 3.246 | .000 | .099 | .066 | .629 | .000 | .795 | 19.672 | 4.041 | 2.303 |
| 20.0- 20.9 | 2.362 | .090 | .060 | .120 | .508 | .000 | .777 | 24.762 | 3.139 | 1.789 |
| 21.0- 21.9 | 2.332 | .027 | .027 | .054 | .488 | .000 | .597 | 20.370 | 2.928 | 1.669 |
| 22.0- 22.9 | 1.680 | .025 | .074 | .124 | .346 | .000 | .568 | 25.275 | 2.248 | 1.281 |
| 23.0- 23.9 | .955 | .000 | .045 | .045 | .249 | .000 | .339 | 25.424 | 1.334 | .760 |
| 24.0- 24.9 | .664 | .021 | .000 | .021 | .228 | .000 | .270 | 28.889 | .934 | .532 |
| 25.0- 25.9 | .555 | .000 | .019 | .019 | .153 | .000 | .191 | 25.641 | .746 | .425 |
| 26.0- 26.9 | .548 | .018 | .018 | .035 | .159 | .000 | .230 | 29.545 | .778 | .444 |
| 27.0- 27.9 | .197 | .016 | .000 | .033 | .049 | .000 | .098 | 33.333 | .295 | .168 |
| 28.0- 28.9 | .122 | .000 | .000 | .000 | .076 | .000 | .076 | 38.462 | .198 | .113 |
| 29.0- 29.9 | .100 | .000 | .014 | .000 | .100 | .000 | .114 | 53.333 | .213 | .122 |
| 30.0- 30.9 | .080 | .013 | .000 | .000 | .040 | .000 | .053 | 40.000 | .133 | .076 |
| 31.0- 31.9 | .050 | .000 | .000 | .012 | .075 | .000 | .087 | 63.636 | .137 | .078 |
| 32.0- 32.9 | .058 | .012 | .000 | .000 | .023 | .000 | .035 | 37.500 | .093 | .053 |
| 33.0- 33.9 | .033 | .000 | .000 | .000 | .022 | .000 | .022 | 40.000 | .055 | .031 |
| TOTAL | 158.85 | 1.15 | .85 | 1.36 | 13.25 | .00 | 16.61 | 9.46 | 175.45 | 100.00 |
| PERCENT | 90.54 | .66 | .48 | .78 | 7.55 | .00 | 9.46 | | | |

TABLE 7.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY LOW STRATA 1
HOST SPECIES IS ENGELMANN SPRUCE THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 460 PLOTS, AND REPRESENT AN AREA OF 15122.ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

SQ. FT. OF BASAL AREA PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 2.087 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 2.087 | 1.417 |
| 6.0- 6.9 | 2.739 | .000 | .000 | .000 | .196 | .000 | .196 | 6.667 | 2.935 | 1.992 |
| 7.0- 7.9 | 4.957 | .000 | .000 | .000 | .130 | .000 | .130 | 2.564 | 5.087 | 3.453 |
| 8.0- 8.9 | 4.565 | .065 | .000 | .000 | .196 | .000 | .261 | 5.405 | 4.826 | 3.276 |
| 9.0- 9.9 | 5.870 | .000 | .000 | .000 | .391 | .000 | .391 | 6.250 | 6.261 | 4.250 |
| 10.0- 10.9 | 6.391 | .000 | .000 | .000 | .848 | .000 | .848 | 11.712 | 7.239 | 4.914 |
| 11.0- 11.9 | 7.304 | .000 | .000 | .065 | .391 | .000 | .457 | 5.882 | 7.761 | 5.268 |
| 12.0- 12.9 | 7.826 | .196 | .000 | .000 | .457 | .000 | .652 | 7.692 | 8.478 | 5.755 |
| 13.0- 13.9 | 8.674 | .065 | .065 | .130 | .457 | .000 | .717 | 7.639 | 9.391 | 6.375 |
| 14.0- 14.9 | 8.935 | .130 | .130 | .000 | 1.370 | .000 | 1.630 | 15.432 | 10.565 | 7.171 |
| 15.0- 15.9 | 7.565 | .000 | .000 | .130 | .783 | .000 | .913 | 10.769 | 8.478 | 5.755 |
| 16.0- 16.9 | 8.935 | .130 | .130 | .065 | .783 | .000 | 1.109 | 11.039 | 10.043 | 6.817 |
| 17.0- 17.9 | 7.043 | .196 | .326 | .457 | 1.109 | .000 | 2.087 | 22.857 | 9.130 | 6.197 |
| 18.0- 18.9 | 7.109 | .130 | .000 | .261 | 1.239 | .000 | 1.630 | 18.657 | 8.739 | 5.932 |
| 19.0- 19.9 | 6.391 | .000 | .196 | .130 | 1.239 | .000 | 1.565 | 19.672 | 7.957 | 5.401 |
| 20.0- 20.9 | 5.152 | .196 | .130 | .261 | 1.109 | .000 | 1.696 | 24.762 | 6.848 | 4.648 |
| 21.0- 21.9 | 5.609 | .065 | .065 | .130 | 1.174 | .000 | 1.435 | 20.370 | 7.043 | 4.781 |
| 22.0- 22.9 | 4.435 | .065 | .196 | .326 | .913 | .000 | 1.500 | 25.275 | 5.935 | 4.028 |
| 23.0- 23.9 | 2.870 | .000 | .130 | .130 | .717 | .000 | .978 | 25.424 | 3.848 | 2.612 |
| 24.0- 24.9 | 2.087 | .065 | .000 | .065 | .717 | .000 | .848 | 28.889 | 2.935 | 1.992 |
| 25.0- 25.9 | 1.891 | .000 | .065 | .065 | .522 | .000 | .652 | 25.641 | 2.543 | 1.726 |
| 26.0- 26.9 | 2.022 | .065 | .065 | .130 | .587 | .000 | .848 | 29.545 | 2.870 | 1.948 |
| 27.0- 27.9 | .783 | .065 | .000 | .130 | .196 | .000 | .391 | 33.333 | 1.174 | .797 |
| 28.0- 28.9 | .522 | .000 | .000 | .000 | .326 | .000 | .326 | 38.462 | .848 | .575 |
| 29.0- 29.9 | .457 | .000 | .065 | .000 | .457 | .000 | .522 | 53.333 | .978 | .664 |
| 30.0- 30.9 | .391 | .065 | .000 | .000 | .196 | .000 | .261 | 40.000 | .652 | .443 |
| 31.0- 31.9 | .261 | .000 | .000 | .065 | .391 | .000 | .457 | 63.636 | .717 | .487 |
| 32.0- 32.9 | .326 | .065 | .000 | .000 | .130 | .000 | .196 | 37.500 | .522 | .354 |
| 33.0- 33.9 | .196 | .000 | .000 | .000 | .130 | .000 | .130 | 40.000 | .326 | .221 |
| 34.0- 34.9 | .196 | .000 | .000 | .000 | .065 | .000 | .065 | 25.000 | .261 | .177 |
| 35.0- 35.9 | .196 | .065 | .000 | .000 | .065 | .000 | .130 | 40.000 | .326 | .221 |
| 36.0- 36.9 | .130 | .000 | .000 | .000 | .130 | .000 | .130 | 50.000 | .261 | .177 |
| 39.0- 39.9 | .065 | .000 | .000 | .000 | .065 | .000 | .065 | 50.000 | .130 | .089 |
| 40.0- 40.9 | .000 | .000 | .000 | .000 | .130 | .000 | .130 | 100.000 | .130 | .089 |
| TOTAL | 123.98 | 1.63 | 1.57 | 2.54 | 17.61 | .00 | 23.35 | 15.85 | 147.33 | 100.00 |
| PERCENT | 84.15 | 1.11 | 1.06 | 1.73 | 11.95 | .00 | 15.85 | | | |

TABLE 8.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY FOR STRATA 1
HOST SPECIES IS ENGELMANN SPRUCE THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE. THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 460 PLOTS, AND REPRESENT AN AREA OF 15120. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

NUMBERS OF TREES PER ACRE

| DBH | CORKBARK | DOUG FIR | ASPEN PI | WHITE PI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 11.001 | 1.435 | 1.435 | .000 | .000 | 13.871 | 15.041 |
| 6.0- 6.9 | 8.968 | .000 | 3.321 | .000 | .000 | 12.290 | 13.327 |
| 7.0- 7.9 | 9.517 | .244 | 1.220 | .000 | .000 | 10.981 | 11.908 |
| 8.0- 8.9 | 7.100 | .561 | 2.429 | .000 | .000 | 10.089 | 10.940 |
| 9.0- 9.9 | 5.757 | .590 | 2.952 | .000 | .000 | 9.300 | 10.085 |
| 10.0- 10.9 | 5.620 | .359 | 2.870 | .000 | .000 | 8.848 | 9.595 |
| 11.0- 11.9 | 3.063 | .296 | 1.640 | .000 | .000 | 5.040 | 5.465 |
| 12.0- 12.9 | 2.408 | .498 | 1.329 | .000 | .083 | 4.318 | 4.682 |
| 13.0- 13.9 | 1.769 | .495 | .778 | .000 | .000 | 3.042 | 3.299 |
| 14.0- 14.9 | 1.769 | .366 | .549 | .000 | .000 | 2.684 | 2.911 |
| 15.0- 15.9 | 1.329 | .266 | .213 | .000 | .053 | 1.860 | 2.017 |
| 16.0- 16.9 | .981 | .327 | .561 | .000 | .000 | 1.868 | 2.026 |
| 17.0- 17.9 | .952 | .290 | .538 | .000 | .000 | 1.779 | 1.929 |
| 18.0- 18.9 | .480 | .480 | .185 | .000 | .000 | 1.144 | 1.241 |
| 19.0- 19.9 | .298 | .364 | .331 | .000 | .000 | .994 | 1.078 |
| 20.0- 20.9 | .269 | .329 | .179 | .030 | .000 | .807 | .875 |
| 21.0- 21.9 | .081 | .325 | .027 | .000 | .000 | .434 | .470 |
| 22.0- 22.9 | .148 | .321 | .074 | .000 | .000 | .544 | .589 |
| 23.0- 23.9 | .158 | .249 | .045 | .000 | .000 | .452 | .490 |
| 24.0- 24.9 | .000 | .311 | .021 | .000 | .000 | .332 | .360 |
| 25.0- 25.9 | .019 | .210 | .019 | .000 | .000 | .249 | .270 |
| 26.0- 26.9 | .018 | .318 | .000 | .000 | .000 | .336 | .364 |
| 27.0- 27.9 | .018 | .213 | .018 | .000 | .000 | .230 | .249 |
| 28.0- 28.9 | .000 | .076 | .000 | .000 | .016 | .092 | .099 |
| 29.0- 29.9 | .000 | .071 | .000 | .000 | .000 | .071 | .077 |
| 30.0- 30.9 | .000 | .120 | .000 | .013 | .000 | .133 | .144 |
| 31.0- 31.9 | .012 | .025 | .000 | .000 | .000 | .037 | .040 |
| 32.0- 32.9 | .012 | .093 | .000 | .000 | .000 | .105 | .114 |
| 33.0- 33.9 | .000 | .033 | .022 | .000 | .000 | .055 | .060 |
| 34.0- 34.9 | .000 | .052 | .000 | .000 | .000 | .052 | .056 |
| 35.0- 35.9 | .000 | .039 | .000 | .000 | .000 | .039 | .042 |
| 36.0- 36.9 | .000 | .046 | .000 | .000 | .000 | .046 | .050 |
| 37.0- 37.9 | .000 | .035 | .000 | .000 | .000 | .035 | .038 |
| 38.0- 38.9 | .000 | .008 | .000 | .000 | .000 | .008 | .009 |
| 40.0- 40.9 | .000 | .007 | .000 | .000 | .000 | .007 | .008 |
| 42.0- 42.9 | .000 | .007 | .000 | .000 | .000 | .007 | .007 |
| 43.0- 43.9 | .000 | .006 | .000 | .000 | .000 | .006 | .007 |
| 44.0- 44.9 | .000 | .012 | .000 | .000 | .000 | .012 | .013 |
| 45.0- 45.9 | .000 | .006 | .000 | .000 | .000 | .006 | .006 |
| 48.0- 48.9 | .000 | .005 | .000 | .000 | .000 | .005 | .006 |
| 49.0- 49.9 | .000 | .005 | .000 | .000 | .000 | .005 | .005 |
| 50.0-100.0 | .000 | .004 | .000 | .000 | .000 | .004 | .004 |
| TOTAL | 61.78 | 9.50 | 20.78 | .01 | .16 | 92.22 | 33.01 |
| PERCENT | 66.99 | 10.30 | 22.53 | .01 | .16 | 100.00 | |

TABLE 9.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY BY STRATA 1
HOST SPECIES IS ENGELM SPRUCE

THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMP IN WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 460 PLOTS, AND
REPRESENT AN AREA OF 15122.ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

SQ. FT. OF BASAL AREA

PER ACRE

| DBH | CORKBARK | DOUG FIR | ASPEN FI | WHITE FI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 1.500 | .196 | .196 | .000 | .000 | 1.891 | 3.281 |
| 6.0- 6.9 | 1.761 | .000 | .652 | .000 | .000 | 2.413 | 4.186 |
| 7.0- 7.9 | 2.543 | .065 | .326 | .000 | .000 | 2.935 | 5.091 |
| 8.0- 8.9 | 2.478 | .196 | .848 | .000 | .000 | 3.522 | 6.109 |
| 9.0- 9.9 | 2.543 | .261 | 1.304 | .000 | .000 | 4.109 | 7.127 |
| 10.0- 10.9 | 3.065 | .196 | 1.565 | .000 | .000 | 4.826 | 8.371 |
| 11.0- 11.9 | 2.022 | .196 | 1.109 | .000 | .000 | 3.326 | 5.769 |
| 12.0- 12.9 | 1.891 | .391 | 1.043 | .000 | .065 | 3.391 | 5.882 |
| 13.0- 13.9 | 1.630 | .457 | .717 | .000 | .000 | 2.804 | 4.864 |
| 14.0- 14.9 | 1.891 | .391 | .587 | .000 | .000 | 2.870 | 4.977 |
| 15.0- 15.9 | 1.630 | .326 | .261 | .000 | .065 | 2.283 | 3.959 |
| 16.0- 16.9 | 1.370 | .457 | .783 | .000 | .000 | 2.609 | 4.525 |
| 17.0- 17.9 | 1.500 | .457 | .848 | .000 | .000 | 2.804 | 4.864 |
| 18.0- 18.9 | .848 | .848 | .326 | .000 | .000 | 2.022 | 3.507 |
| 19.0- 19.9 | .587 | .717 | .652 | .000 | .000 | 1.957 | 3.394 |
| 20.0- 20.9 | .652 | .717 | .391 | .000 | .000 | 1.761 | 3.054 |
| 21.0- 21.9 | .196 | .783 | .065 | .000 | .000 | 1.043 | 1.810 |
| 22.0- 22.9 | .391 | .848 | .196 | .000 | .000 | 1.435 | 2.489 |
| 23.0- 23.9 | .457 | .717 | .130 | .000 | .000 | 1.304 | 2.262 |
| 24.0- 24.9 | .000 | .978 | .065 | .000 | .000 | 1.043 | 1.810 |
| 25.0- 25.9 | .065 | .717 | .065 | .000 | .000 | .848 | 1.471 |
| 26.0- 26.9 | .065 | 1.174 | .000 | .000 | .000 | 1.239 | 2.149 |
| 27.0- 27.9 | .065 | .848 | .000 | .000 | .000 | .913 | 1.584 |
| 28.0- 28.9 | .000 | .326 | .000 | .000 | .065 | .391 | .679 |
| 29.0- 29.9 | .000 | .326 | .000 | .000 | .000 | .326 | .566 |
| 30.0- 30.9 | .000 | .587 | .000 | .065 | .000 | .652 | 1.131 |
| 31.0- 31.9 | .065 | .130 | .000 | .000 | .000 | .196 | .339 |
| 32.0- 32.9 | .065 | .522 | .000 | .000 | .000 | .587 | 1.018 |
| 33.0- 33.9 | .000 | .196 | .130 | .000 | .000 | .326 | .566 |
| 34.0- 34.9 | .000 | .326 | .000 | .000 | .000 | .326 | .566 |
| 35.0- 35.9 | .000 | .261 | .000 | .000 | .000 | .261 | .452 |
| 36.0- 36.9 | .000 | .326 | .000 | .000 | .000 | .326 | .566 |
| 37.0- 37.9 | .000 | .261 | .000 | .000 | .000 | .261 | .452 |
| 38.0- 38.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 40.0- 40.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 42.0- 42.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 43.0- 43.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 44.0- 44.9 | .000 | .130 | .000 | .000 | .000 | .130 | .226 |
| 45.0- 45.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 48.0- 48.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 49.0- 49.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| 50.0-100.9 | .000 | .065 | .000 | .000 | .000 | .065 | .113 |
| TOTAL | 29.28 | 15.85 | 12.06 | .07 | .20 | 57.65 | .00 |
| PERCENT | 50.79 | 27.49 | 21.07 | .11 | .34 | 100.00 | |

TABLE 10.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY MOD STRATA 2
HOST SPECIES IS ENGLMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE — THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 95 PLOTS, AND REPRESENT AN AREA OF 1629. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 6.948 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 6.948 | 4.130 |
| 6.0- 6.9 | 11.258 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 11.258 | 6.691 |
| 7.0- 7.9 | 18.906 | .000 | .000 | .000 | 1.182 | .000 | 1.182 | 5.882 | 20.087 | 11.939 |
| 8.0- 8.9 | 12.665 | .000 | .000 | .905 | 2.714 | .000 | 3.619 | 22.222 | 16.284 | 9.679 |
| 9.0- 9.9 | 12.866 | .000 | .715 | .000 | .715 | .000 | 1.430 | 10.000 | 14.296 | 8.497 |
| 10.0- 10.9 | 17.370 | .579 | .000 | .000 | 1.737 | .000 | 2.316 | 11.765 | 19.686 | 11.700 |
| 11.0- 11.9 | 14.355 | .479 | .000 | .000 | 1.914 | .000 | 2.393 | 14.286 | 16.748 | 9.954 |
| 12.0- 12.9 | 6.835 | .000 | .402 | .000 | .804 | .000 | 1.206 | 15.000 | 8.042 | 4.780 |
| 13.0- 13.9 | 7.880 | .343 | .000 | .000 | .685 | .000 | 1.028 | 11.538 | 8.908 | 5.294 |
| 14.0- 14.9 | 5.908 | .295 | .295 | .000 | .886 | .000 | 1.477 | 20.000 | 7.385 | 4.389 |
| 15.0- 15.9 | 6.948 | .000 | .000 | .515 | .257 | .000 | .772 | 10.000 | 7.720 | 4.588 |
| 16.0- 16.9 | 3.619 | .000 | .226 | .226 | .226 | .000 | .679 | 15.789 | 4.297 | 2.554 |
| 17.0- 17.9 | 3.807 | .000 | .000 | .401 | .601 | .000 | 1.002 | 20.833 | 4.808 | 2.858 |
| 18.0- 18.9 | 2.859 | .000 | .357 | .000 | 1.251 | .000 | 1.608 | 36.000 | 4.468 | 2.655 |
| 19.0- 19.9 | 2.566 | .160 | .481 | .160 | .000 | .000 | .802 | 23.810 | 3.368 | 2.002 |
| 20.0- 20.9 | 2.026 | .145 | .145 | .000 | .579 | .000 | .868 | 30.000 | 2.895 | 1.721 |
| 21.0- 21.9 | 1.050 | .000 | .656 | .000 | .788 | .000 | 1.444 | 57.895 | 2.495 | 1.483 |
| 22.0- 22.9 | 1.196 | .000 | .000 | .000 | .359 | .000 | .359 | 23.077 | 1.555 | .924 |
| 23.0- 23.9 | 1.313 | .000 | .109 | .000 | .109 | .000 | .219 | 14.286 | 1.532 | .911 |
| 24.0- 24.9 | .804 | .101 | .101 | .101 | .201 | .000 | .503 | 38.462 | 1.307 | .777 |
| 25.0- 25.9 | .741 | .000 | .093 | .185 | .185 | .000 | .463 | 38.462 | 1.204 | .716 |
| 26.0- 26.9 | .428 | .086 | .086 | .000 | .428 | .000 | .600 | 58.333 | 1.028 | .611 |
| 27.0- 27.9 | .477 | .000 | .000 | .000 | .159 | .000 | .159 | 25.000 | .635 | .378 |
| 28.0- 28.9 | .295 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .295 | .176 |
| 29.0- 29.9 | .207 | .000 | .000 | .138 | .138 | .000 | .275 | 57.143 | .482 | .286 |
| 30.0- 30.9 | .000 | .000 | .000 | .000 | .064 | .000 | .064 | 100.000 | .064 | .038 |
| 31.0- 31.9 | .120 | .000 | .000 | .000 | .181 | .000 | .181 | 60.000 | .301 | .179 |
| 33.0- 33.9 | .053 | .000 | .000 | .000 | .053 | .000 | .053 | 50.000 | .106 | .063 |
| 36.0- 36.9 | .045 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .045 | .027 |
| TOTAL | 143.55 | 2.19 | 3.67 | 2.63 | 16.22 | .00 | 24.70 | 14.68 | 168.25 | 100.00 |
| PERCENT | 85.32 | 1.30 | 2.18 | 1.56 | 9.64 | .00 | 14.68 | | | |

TABLE 11.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY MOD STRATA 2
HOST SPECIES IS ENGLMANN SPRUCE THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 95 PLOTS, AND

REPRESENT AN AREA OF 1629. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

SQ. FT. OF BASAL AREA

PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | .947 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .947 | .658 |
| 6.0- 6.9 | 2.211 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 2.211 | 1.535 |
| 7.0- 7.9 | 5.053 | .000 | .000 | .000 | .316 | .000 | .316 | 5.882 | 5.368 | 3.728 |
| 8.0- 8.9 | 4.421 | .000 | .000 | .316 | .947 | .000 | 1.263 | 22.222 | 5.684 | 3.947 |
| 9.0- 9.9 | 5.684 | .000 | .316 | .000 | .316 | .000 | .632 | 10.000 | 6.316 | 4.386 |
| 10.0- 10.9 | 9.474 | .316 | .000 | .000 | .947 | .000 | 1.263 | 11.765 | 10.737 | 7.456 |
| 11.0- 11.9 | 9.474 | .316 | .000 | .000 | 1.263 | .000 | 1.579 | 14.286 | 11.053 | 7.675 |
| 12.0- 12.9 | 5.368 | .000 | .316 | .000 | .632 | .000 | .947 | 15.000 | 6.316 | 4.386 |
| 13.0- 13.9 | 7.263 | .316 | .000 | .000 | .632 | .000 | .947 | 11.538 | 8.211 | 5.702 |
| 14.0- 14.9 | 6.316 | .316 | .316 | .000 | .947 | .000 | 1.579 | 20.000 | 7.895 | 5.482 |
| 15.0- 15.9 | 8.526 | .000 | .000 | .632 | .316 | .000 | .947 | 10.000 | 9.474 | 6.579 |
| 16.0- 16.9 | 5.053 | .000 | .316 | .316 | .316 | .000 | .947 | 15.789 | 6.000 | 4.167 |
| 17.0- 17.9 | 6.000 | .000 | .000 | .632 | .947 | .000 | 1.579 | 20.833 | 7.579 | 5.263 |
| 18.0- 18.9 | 5.053 | .000 | .632 | .000 | 2.211 | .000 | 2.842 | 36.000 | 7.895 | 5.482 |
| 19.0- 19.9 | 5.053 | .316 | .947 | .316 | .000 | .000 | 1.579 | 23.810 | 6.632 | 4.605 |
| 20.0- 20.9 | 4.421 | .316 | .316 | .000 | 1.263 | .000 | 1.895 | 30.000 | 6.316 | 4.386 |
| 21.0- 21.9 | 2.526 | .000 | 1.579 | .000 | 1.895 | .000 | 3.474 | 57.895 | 6.000 | 4.167 |
| 22.0- 22.9 | 3.158 | .000 | .000 | .000 | .947 | .000 | .947 | 23.077 | 4.105 | 2.851 |
| 23.0- 23.9 | 3.789 | .000 | .316 | .000 | .316 | .000 | .632 | 14.286 | 4.421 | 3.070 |
| 24.0- 24.9 | 2.526 | .316 | .316 | .316 | .632 | .000 | 1.579 | 38.462 | 4.105 | 2.851 |
| 25.0- 25.9 | 2.526 | .000 | .316 | .632 | .632 | .000 | 1.579 | 38.462 | 4.105 | 2.851 |
| 26.0- 26.9 | 1.579 | .316 | .316 | .000 | 1.579 | .000 | 2.211 | 58.333 | 3.789 | 2.632 |
| 27.0- 27.9 | 1.895 | .000 | .000 | .000 | .632 | .000 | .632 | 25.000 | 2.526 | 1.754 |
| 28.0- 28.9 | 1.263 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 1.263 | .877 |
| 29.0- 29.9 | .947 | .000 | .000 | .632 | .632 | .000 | 1.263 | 57.143 | 2.211 | 1.535 |
| 30.0- 30.9 | .000 | .000 | .000 | .000 | .316 | .000 | .316 | 100.000 | .316 | .219 |
| 31.0- 31.9 | .632 | .000 | .000 | .000 | .947 | .000 | .947 | 60.000 | 1.579 | 1.096 |
| 33.0- 33.9 | .316 | .000 | .000 | .000 | .316 | .000 | .316 | 50.000 | .632 | .439 |
| 36.0- 36.9 | .316 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .316 | .219 |
| TOTAL | 111.79 | 2.53 | 6.00 | 3.79 | 19.89 | .00 | 32.21 | 22.37 | 144.00 | 100.00 |
| PERCENT | 77.63 | 1.75 | 4.17 | 2.63 | 13.82 | .00 | 22.37 | | | |

TABLE 12.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY MOD STRATA 2
HOST SPECIES IS ENGLMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE — THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 95 PLOTS, AND

REPRESENT AN AREA OF 1629. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

NUMBERS OF TREES

PER ACRE

| DBH | CORKBARK | DOUG-FIR | ASPEN-PI | WHITE-FI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 6.0- 6.9 | 1.608 | .000 | 1.608 | .000 | .000 | 3.217 | 4.153 |
| 7.0- 7.9 | 7.090 | .000 | 3.545 | .000 | .000 | 10.634 | 13.730 |
| 8.0- 8.9 | 13.570 | .000 | 7.237 | .000 | .000 | 20.807 | 26.864 |
| 9.0- 9.9 | 5.004 | .000 | 3.574 | .000 | .000 | 8.578 | 11.075 |
| 10.0- 10.9 | 2.895 | .000 | 5.790 | .000 | .000 | 8.685 | 11.213 |
| 11.0- 11.9 | 2.871 | .479 | 3.828 | .000 | .000 | 7.178 | 9.267 |
| 12.0- 12.9 | 1.608 | .000 | 2.412 | .000 | .000 | 4.021 | 5.191 |
| 13.0- 13.9 | 1.370 | .343 | 1.713 | .000 | .000 | 3.426 | 4.423 |
| 14.0- 14.9 | .591 | .295 | .591 | .295 | .000 | 1.772 | 2.288 |
| 15.0- 15.9 | .257 | .000 | .257 | .000 | .000 | .515 | .664 |
| 16.0- 16.9 | .905 | .679 | .905 | .000 | .000 | 2.488 | 3.212 |
| 17.0- 17.9 | .601 | .601 | .200 | .000 | .000 | 1.402 | 1.811 |
| 18.0- 18.9 | .179 | .715 | .179 | .000 | .000 | 1.072 | 1.384 |
| 19.0- 19.9 | .321 | .481 | .160 | .000 | .000 | .962 | 1.242 |
| 20.0- 20.9 | .145 | .145 | .145 | .000 | .000 | .434 | .561 |
| 21.0- 21.9 | .131 | .131 | .000 | .000 | .000 | .263 | .339 |
| 22.0- 22.9 | .359 | .120 | .000 | .120 | .000 | .598 | .772 |
| 23.0- 23.9 | .219 | .328 | .000 | .000 | .000 | .547 | .707 |
| 24.0- 24.9 | .000 | .101 | .101 | .000 | .000 | .201 | .260 |
| 27.0- 27.9 | .000 | .159 | .000 | .000 | .000 | .159 | .205 |
| 28.0- 28.9 | .074 | .000 | .000 | .000 | .000 | .074 | .095 |
| 29.0- 29.9 | .069 | .138 | .000 | .000 | .000 | .207 | .267 |
| 31.0- 31.9 | .000 | .060 | .000 | .000 | .000 | .060 | .078 |
| 32.0- 32.9 | .000 | .057 | .000 | .000 | .000 | .057 | .073 |
| 34.0- 34.9 | .000 | .050 | .000 | .000 | .000 | .050 | .065 |
| 35.0- 35.9 | .000 | .047 | .000 | .000 | .000 | .047 | .061 |
| TOTAL | 39.87 | 4.93 | 32.25 | .42 | .00 | 77.45 | 48.53 |
| PERCENT | 51.47 | 6.36 | 41.63 | .54 | .00 | 100.00 | |

TABLE 13.-- FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY MOD STRATA 2
HOST SPECIES IS ENGLMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE — THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 95 PLOTS, AND REPRESENT AN AREA OF 1629. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

SQ. FT. OF BASAL AREA PER ACRE



| DBH | CORKBARK | DOUG-FIR | ASPEN-PI | WHITE-FI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 6.0- 6.9 | .316 | .000 | .316 | .000 | .000 | .632 | 1.242 |
| 7.0- 7.9 | 1.895 | .000 | .947 | .000 | .000 | 2.842 | 5.590 |
| 8.0- 8.9 | 4.737 | .000 | 2.526 | .000 | .000 | 7.263 | 14.286 |
| 9.0- 9.9 | 2.211 | .000 | 1.579 | .000 | .000 | 3.789 | 7.453 |
| 10.0- 10.9 | 1.579 | .000 | 3.158 | .000 | .000 | 4.737 | 9.317 |
| 11.0- 11.9 | 1.895 | .316 | 2.526 | .000 | .000 | 4.737 | 9.317 |
| 12.0- 12.9 | 1.263 | .000 | 1.895 | .000 | .000 | 3.158 | 6.211 |
| 13.0- 13.9 | 1.263 | .316 | 1.579 | .000 | .000 | 3.158 | 6.211 |
| 14.0- 14.9 | .632 | .316 | .632 | .316 | .000 | 1.895 | 3.727 |
| 15.0- 15.9 | .316 | .000 | .316 | .000 | .000 | .632 | 1.242 |
| 16.0- 16.9 | 1.263 | .947 | 1.263 | .000 | .000 | 3.474 | 6.832 |
| 17.0- 17.9 | .947 | .947 | .316 | .000 | .000 | 2.211 | 4.348 |
| 18.0- 18.9 | .316 | 1.263 | .316 | .000 | .000 | 1.895 | 3.727 |
| 19.0- 19.9 | .632 | .947 | .316 | .000 | .000 | 1.895 | 3.727 |
| 20.0- 20.9 | .316 | .316 | .316 | .000 | .000 | .947 | 1.863 |
| 21.0- 21.9 | .316 | .316 | .000 | .000 | .000 | .632 | 1.242 |
| 22.0- 22.9 | .947 | .316 | .000 | .316 | .000 | 1.579 | 3.106 |
| 23.0- 23.9 | .632 | .947 | .000 | .000 | .000 | 1.579 | 3.106 |
| 24.0- 24.9 | .000 | .316 | .316 | .000 | .000 | .632 | 1.242 |
| 27.0- 27.9 | .000 | .632 | .000 | .000 | .000 | .632 | 1.242 |
| 28.0- 28.9 | .316 | .000 | .000 | .000 | .000 | .316 | .621 |
| 29.0- 29.9 | .316 | .632 | .000 | .000 | .000 | .947 | 1.863 |
| 31.0- 31.9 | .000 | .316 | .000 | .000 | .000 | .316 | .621 |
| 32.0- 32.9 | .000 | .316 | .000 | .000 | .000 | .316 | .621 |
| 34.0- 34.9 | .000 | .316 | .000 | .000 | .000 | .316 | .621 |
| 35.0- 35.9 | .000 | .316 | .000 | .000 | .000 | .316 | .621 |
| TOTAL | 22.11 | 9.79 | 18.32 | .63 | .00 | 50.84 | .00 |
| PERCENT | 43.48 | 19.25 | 36.02 | 1.24 | .00 | 100.00 | |

TABLE 14.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY HIGH STRATA3
HOST SPECIES IS ENGELMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE. THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 139 PLOTS, AND REPRESENT AN AREA OF 3331. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 6.331 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 6.331 | 4.780 |
| 6.0- 6.9 | 12.091 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 12.091 | 9.128 |
| 7.0- 7.9 | 14.536 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 14.536 | 10.973 |
| 8.0- 8.9 | 12.366 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 12.366 | 9.335 |
| 9.0- 9.9 | 8.305 | .000 | .000 | .000 | .977 | .000 | .977 | 10.526 | 9.282 | 7.007 |
| 10.0- 10.9 | 8.310 | .000 | .000 | .000 | .791 | .000 | .791 | 8.696 | 9.101 | 6.871 |
| 11.0- 11.9 | 8.830 | .000 | .000 | .327 | .000 | .000 | .327 | 3.571 | 9.157 | 6.913 |
| 12.0- 12.9 | 7.694 | .000 | .000 | .000 | 1.099 | .000 | 1.099 | 12.500 | 8.794 | 6.638 |
| 13.0- 13.9 | 5.620 | .468 | .000 | .000 | .702 | .000 | 1.171 | 17.241 | 6.790 | 5.126 |
| 14.0- 14.9 | 5.653 | .404 | .202 | .000 | 1.211 | .000 | 1.817 | 24.324 | 7.470 | 5.639 |
| 15.0- 15.9 | 4.573 | .000 | .000 | .176 | .703 | .000 | .879 | 16.129 | 5.452 | 4.116 |
| 16.0- 16.9 | 3.401 | .000 | .000 | .155 | .155 | .000 | .309 | 8.333 | 3.710 | 2.801 |
| 17.0- 17.9 | 3.834 | .137 | .411 | .000 | .137 | .000 | .685 | 15.152 | 4.519 | 3.411 |
| 18.0- 18.9 | 3.786 | .000 | .122 | .244 | .489 | .000 | .855 | 18.421 | 4.641 | 3.504 |
| 19.0- 19.9 | 2.302 | .219 | .110 | .110 | .767 | .000 | 1.206 | 34.375 | 3.508 | 2.648 |
| 20.0- 20.9 | 1.781 | .099 | .000 | .099 | 1.187 | .000 | 1.385 | 43.750 | 3.166 | 2.390 |
| 21.0- 21.9 | 1.256 | .090 | .000 | .090 | .718 | .000 | .897 | 41.667 | 2.154 | 1.626 |
| 22.0- 22.9 | 1.145 | .092 | .082 | .164 | .654 | .000 | .981 | 46.154 | 2.126 | 1.605 |
| 23.0- 23.9 | .898 | .000 | .150 | .000 | .449 | .000 | .598 | 40.000 | 1.496 | 1.129 |
| 24.0- 24.9 | .412 | .000 | .000 | .000 | .344 | .000 | .344 | 45.455 | .756 | .570 |
| 25.0- 25.9 | .380 | .000 | .000 | .127 | .696 | .000 | .823 | 68.421 | 1.203 | .908 |
| 26.0- 26.9 | .468 | .000 | .059 | .000 | .527 | .000 | .585 | 55.556 | 1.054 | .795 |
| 27.0- 27.9 | .271 | .054 | .000 | .000 | .543 | .000 | .597 | 68.750 | .869 | .656 |
| 28.0- 28.9 | .202 | .000 | .000 | .000 | .303 | .000 | .303 | 60.000 | .505 | .381 |
| 29.0- 29.9 | .141 | .000 | .000 | .047 | .235 | .000 | .282 | 66.667 | .423 | .320 |
| 30.0- 30.9 | .176 | .044 | .044 | .044 | .088 | .000 | .220 | 55.556 | .396 | .299 |
| 31.0- 31.9 | .041 | .000 | .000 | .041 | .041 | .000 | .082 | 66.667 | .124 | .093 |
| 32.0- 32.9 | .000 | .000 | .000 | .000 | .116 | .000 | .116 | 100.000 | .116 | .088 |
| 34.0- 34.9 | .000 | .000 | .000 | .000 | .068 | .000 | .068 | 100.000 | .068 | .052 |
| 35.0- 35.9 | .000 | .032 | .000 | .000 | .032 | .000 | .065 | 100.000 | .065 | .049 |
| 36.0- 36.9 | .061 | .000 | .000 | .000 | .031 | .000 | .031 | 33.333 | .092 | .069 |
| 37.0- 37.9 | .029 | .000 | .000 | .029 | .000 | .000 | .029 | 50.000 | .058 | .044 |
| 38.0- 38.9 | .027 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .027 | .021 |
| 40.0- 40.9 | .025 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .025 | .019 |
| TOTAL | 114.95 | 1.63 | 1.18 | 1.65 | 13.06 | .00 | 17.52 | 13.23 | 132.47 | 100.00 |
| PERCENT | 86.77 | 1.23 | .89 | 1.25 | 9.86 | .00 | 13.23 | | | |

TABLE 15.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY HIGH STRATA3
HOST SPECIES IS ENGELMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE — THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 139 PLOTS, AND REPRESENT AN AREA OF 3331. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES HOST TREES

SQ. FT. OF BASAL AREA

PER ACRE

| DBH | GREEN | CURRENT | PREV 82 | PARTIAL | OLD | BLOWDOWN | TTL AK | PERCENT | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | .863 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .863 | .678 |
| 6.0- 6.9 | 2.374 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 2.374 | 1.864 |
| 7.0- 7.9 | 3.885 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 3.885 | 3.051 |
| 8.0- 8.9 | 4.317 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | 4.317 | 3.390 |
| 9.0- 9.9 | 3.669 | .000 | .000 | .000 | .432 | .000 | .432 | 10.526 | 4.101 | 3.220 |
| 10.0- 10.9 | 4.532 | .000 | .000 | .000 | .432 | .000 | .432 | 8.696 | 4.964 | 3.898 |
| 11.0- 11.9 | 5.827 | .000 | .000 | .216 | .000 | .000 | .216 | 3.571 | 6.043 | 4.746 |
| 12.0- 12.9 | 6.043 | .000 | .000 | .000 | .863 | .000 | .863 | 12.500 | 6.906 | 5.424 |
| 13.0- 13.9 | 5.180 | .432 | .000 | .000 | .647 | .000 | 1.079 | 17.241 | 6.259 | 4.915 |
| 14.0- 14.9 | 6.043 | .432 | .216 | .000 | 1.295 | .000 | 1.942 | 24.324 | 7.986 | 6.271 |
| 15.0- 15.9 | 5.612 | .000 | .000 | .216 | .863 | .000 | 1.079 | 16.129 | 6.691 | 5.254 |
| 16.0- 16.9 | 4.748 | .000 | .000 | .216 | .216 | .000 | .432 | 8.333 | 5.180 | 4.068 |
| 17.0- 17.9 | 6.043 | .216 | .647 | .000 | .216 | .000 | 1.079 | 15.152 | 7.122 | 5.593 |
| 18.0- 18.9 | 6.691 | .000 | .216 | .432 | .863 | .000 | 1.511 | 18.421 | 8.201 | 6.441 |
| 19.0- 19.9 | 4.532 | .432 | .216 | .216 | 1.511 | .000 | 2.374 | 34.375 | 6.906 | 5.424 |
| 20.0- 20.9 | 3.885 | .216 | .000 | .216 | 2.590 | .000 | 3.022 | 43.750 | 6.906 | 5.424 |
| 21.0- 21.9 | 3.022 | .216 | .000 | .216 | 1.727 | .000 | 2.158 | 41.667 | 5.180 | 4.068 |
| 22.0- 22.9 | 3.022 | .216 | .216 | .432 | 1.727 | .000 | 2.590 | 46.154 | 5.612 | 4.407 |
| 23.0- 23.9 | 2.590 | .000 | .432 | .000 | 1.295 | .000 | 1.727 | 40.000 | 4.317 | 3.390 |
| 24.0- 24.9 | 1.295 | .000 | .000 | .000 | 1.079 | .000 | 1.079 | 45.455 | 2.374 | 1.864 |
| 25.0- 25.9 | 1.295 | .000 | .000 | .432 | 2.374 | .000 | 2.806 | 68.421 | 4.101 | 3.220 |
| 26.0- 26.9 | 1.727 | .000 | .216 | .000 | 1.942 | .000 | 2.158 | 55.556 | 3.885 | 3.051 |
| 27.0- 27.9 | 1.079 | .216 | .000 | .000 | 2.158 | .000 | 2.374 | 68.750 | 3.453 | 2.712 |
| 28.0- 28.9 | .863 | .000 | .000 | .000 | 1.295 | .000 | 1.295 | 60.000 | 2.158 | 1.695 |
| 29.0- 29.9 | .647 | .000 | .000 | .216 | 1.079 | .000 | 1.295 | 66.667 | 1.942 | 1.525 |
| 30.0- 30.9 | .863 | .216 | .216 | .216 | .432 | .000 | 1.079 | 55.556 | 1.942 | 1.525 |
| 31.0- 31.9 | .216 | .000 | .000 | .216 | .216 | .000 | .432 | 66.667 | .647 | .508 |
| 32.0- 32.9 | .000 | .000 | .000 | .000 | .647 | .000 | .647 | 100.000 | .647 | .508 |
| 34.0- 34.9 | .000 | .000 | .000 | .000 | .432 | .000 | .432 | 100.000 | .432 | .339 |
| 35.0- 35.9 | .000 | .216 | .000 | .000 | .216 | .000 | .432 | 100.000 | .432 | .339 |
| 36.0- 36.9 | .432 | .000 | .000 | .000 | .216 | .000 | .216 | 33.333 | .647 | .508 |
| 37.0- 37.9 | .216 | .000 | .000 | .216 | .000 | .000 | .216 | 50.000 | .432 | .339 |
| 38.0- 38.9 | .216 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .216 | .169 |
| 40.0- 40.9 | .216 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .216 | .169 |
| TOTAL | 91.94 | 2.81 | 2.37 | 3.45 | 26.76 | .00 | 35.40 | 27.80 | 127.34 | 100.00 |
| PERCENT | 72.20 | 2.20 | 1.86 | 2.71 | 21.02 | .00 | 27.80 | | | |

TABLE 16.--FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY HIGH STRATA3
HOST SPECIES IS ENGELMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE — THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 139 PLOTS. AND REPRESENT AN AREA OF 3331.ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

NUMBERS OF TREES PER ACRE

| DBH | CORKBARK | DOUG-FIR | ASPEN-PI | WHITE-FI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | 4.749 | .000 | 1.583 | .000 | .000 | 6.331 | 13.636 |
| 6.0- 6.9 | 3.298 | 1.099 | .000 | .000 | .000 | 4.397 | 9.470 |
| 7.0- 7.9 | 4.038 | .808 | .000 | .000 | .000 | 4.845 | 10.436 |
| 8.0- 8.9 | 3.710 | 1.237 | .618 | .000 | .000 | 5.565 | 11.985 |
| 9.0- 9.9 | .977 | .000 | 1.954 | .000 | .000 | 2.931 | 6.313 |
| 10.0- 10.9 | 1.979 | .396 | .000 | .396 | .000 | 2.770 | 5.966 |
| 11.0- 11.9 | 2.616 | .654 | .654 | .000 | .000 | 3.924 | 8.452 |
| 12.0- 12.9 | 1.924 | .275 | 1.374 | .000 | .000 | 3.572 | 7.694 |
| 13.0- 13.9 | 1.405 | .468 | .000 | .000 | .000 | 1.873 | 4.034 |
| 14.0- 14.9 | 1.413 | .202 | .606 | .000 | .000 | 2.221 | 4.783 |
| 15.0- 15.9 | .528 | .352 | .528 | .000 | .000 | 1.407 | 3.030 |
| 16.0- 16.9 | .773 | .464 | .309 | .000 | .000 | 1.546 | 3.329 |
| 17.0- 17.9 | .685 | .274 | .274 | .000 | .000 | 1.232 | 2.654 |
| 18.0- 18.9 | .244 | .122 | .244 | .000 | .000 | .611 | 1.315 |
| 19.0- 19.9 | .219 | .329 | .000 | .000 | .000 | .548 | 1.180 |
| 20.0- 20.9 | .297 | .396 | .099 | .000 | .000 | .791 | 1.705 |
| 21.0- 21.9 | .090 | .269 | .000 | .000 | .000 | .359 | .773 |
| 22.0- 22.9 | .000 | .245 | .000 | .000 | .000 | .245 | .528 |
| 23.0- 23.9 | .075 | .299 | .000 | .000 | .000 | .374 | .806 |
| 24.0- 24.9 | .069 | .000 | .000 | .000 | .000 | .069 | .148 |
| 25.0- 25.9 | .000 | .127 | .000 | .000 | .000 | .127 | .273 |
| 26.0- 26.9 | .059 | .117 | .000 | .000 | .000 | .176 | .378 |
| 27.0- 27.9 | .000 | .054 | .000 | .000 | .000 | .054 | .117 |
| 29.0- 29.9 | .000 | .141 | .000 | .000 | .000 | .141 | .304 |
| 30.0- 30.9 | .000 | .088 | .000 | .000 | .000 | .088 | .189 |
| 31.0- 31.9 | .000 | .082 | .000 | .000 | .000 | .082 | .177 |
| 33.0- 33.9 | .000 | .073 | .000 | .000 | .000 | .073 | .157 |
| 35.0- 35.9 | .000 | .032 | .000 | .000 | .000 | .032 | .070 |
| 39.0- 39.9 | .000 | .026 | .000 | .000 | .000 | .026 | .056 |
| 45.0- 45.9 | .000 | .020 | .000 | .000 | .000 | .020 | .042 |
| TOTAL | 29.14 | 8.65 | 8.24 | .40 | .00 | 46.43 | 37.23 |
| PERCENT | 62.77 | 18.63 | 17.75 | .85 | .00 | 100.00 | |

TABLE 17.-- FOREST INSECT AND DISEASE

SURVEY SUMMARY

POPULATION STAND TABLE
1983 SURVEY HIGH STRATA3
HOST SPECIES IS ENGELMANN SPRUCE — THE PEST IS SPRUCE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE. THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 139 PLOTS, AND REPRESENT AN AREA OF 3331. ACRES.

BAF WAS 30.

THIS TABLE ONLY INCLUDES NON-HOST TREES

SQ. FT. OF BASAL AREA PER ACRE

| DBH | CORKBARK | DOUG-FIR | ASPEN-PI | WHITE-FI | OTHER | TOTAL | PERCENTILE |
|---|---|---|---|---|---|---|---|
| 5.0- 5.9 | .647 | .000 | .216 | .000 | .000 | .863 | 2.564 |
| 6.0- 6.9 | .647 | .216 | .000 | .000 | .000 | .863 | 2.564 |
| 7.0- 7.9 | 1.079 | .216 | .000 | .000 | .000 | 1.295 | 3.846 |
| 8.0- 8.9 | 1.295 | .432 | .216 | .000 | .000 | 1.942 | 5.769 |
| 9.0- 9.9 | .432 | .000 | .863 | .000 | .000 | 1.295 | 3.846 |
| 10.0- 10.9 | 1.079 | .216 | .000 | .216 | .000 | 1.511 | 4.487 |
| 11.0- 11.9 | 1.727 | .432 | .432 | .000 | .000 | 2.590 | 7.692 |
| 12.0- 12.9 | 1.511 | .216 | 1.079 | .000 | .000 | 2.806 | 8.333 |
| 13.0- 13.9 | 1.295 | .432 | .000 | .000 | .000 | 1.727 | 5.128 |
| 14.0- 14.9 | 1.511 | .216 | .647 | .000 | .000 | 2.374 | 7.051 |
| 15.0- 15.9 | .647 | .432 | .647 | .000 | .000 | 1.727 | 5.128 |
| 16.0- 16.9 | 1.079 | .647 | .432 | .000 | .000 | 2.158 | 6.410 |
| 17.0- 17.9 | 1.079 | .432 | .432 | .000 | .000 | 1.942 | 5.769 |
| 18.0- 18.9 | .432 | .216 | .432 | .000 | .000 | 1.079 | 3.205 |
| 19.0- 19.9 | .432 | .647 | .000 | .000 | .000 | 1.079 | 3.205 |
| 20.0- 20.9 | .647 | .863 | .216 | .000 | .000 | 1.727 | 5.128 |
| 21.0- 21.9 | .216 | .647 | .000 | .000 | .000 | .863 | 2.564 |
| 22.0- 22.9 | .000 | .647 | .000 | .000 | .000 | .647 | 1.923 |
| 23.0- 23.9 | .216 | .863 | .000 | .000 | .000 | 1.079 | 3.205 |
| 24.0- 24.9 | .216 | .000 | .000 | .000 | .000 | .216 | .641 |
| 25.0- 25.9 | .000 | .432 | .000 | .000 | .000 | .432 | 1.282 |
| 26.0- 26.9 | .216 | .432 | .000 | .000 | .000 | .647 | 1.923 |
| 27.0- 27.9 | .000 | .216 | .000 | .000 | .000 | .216 | .641 |
| 29.0- 29.9 | .000 | .647 | .000 | .000 | .000 | .647 | 1.923 |
| 30.0- 30.9 | .000 | .432 | .000 | .000 | .000 | .432 | 1.282 |
| 31.0- 31.9 | .000 | .432 | .000 | .000 | .000 | .432 | 1.282 |
| 33.0- 33.9 | .000 | .432 | .000 | .000 | .000 | .432 | 1.282 |
| 35.0- 35.9 | .000 | .216 | .000 | .000 | .000 | .216 | .641 |
| 39.0- 39.9 | .000 | .216 | .000 | .000 | .000 | .216 | .641 |
| 45.0- 45.9 | .000 | .216 | .000 | .000 | .000 | .216 | .641 |
| TOTAL | 16.40 | 11.44 | 5.61 | .22 | .00 | 33.67 | .00 |
| PERCENT | 48.72 | 33.97 | 16.67 | .64 | .00 | 100.00 | |

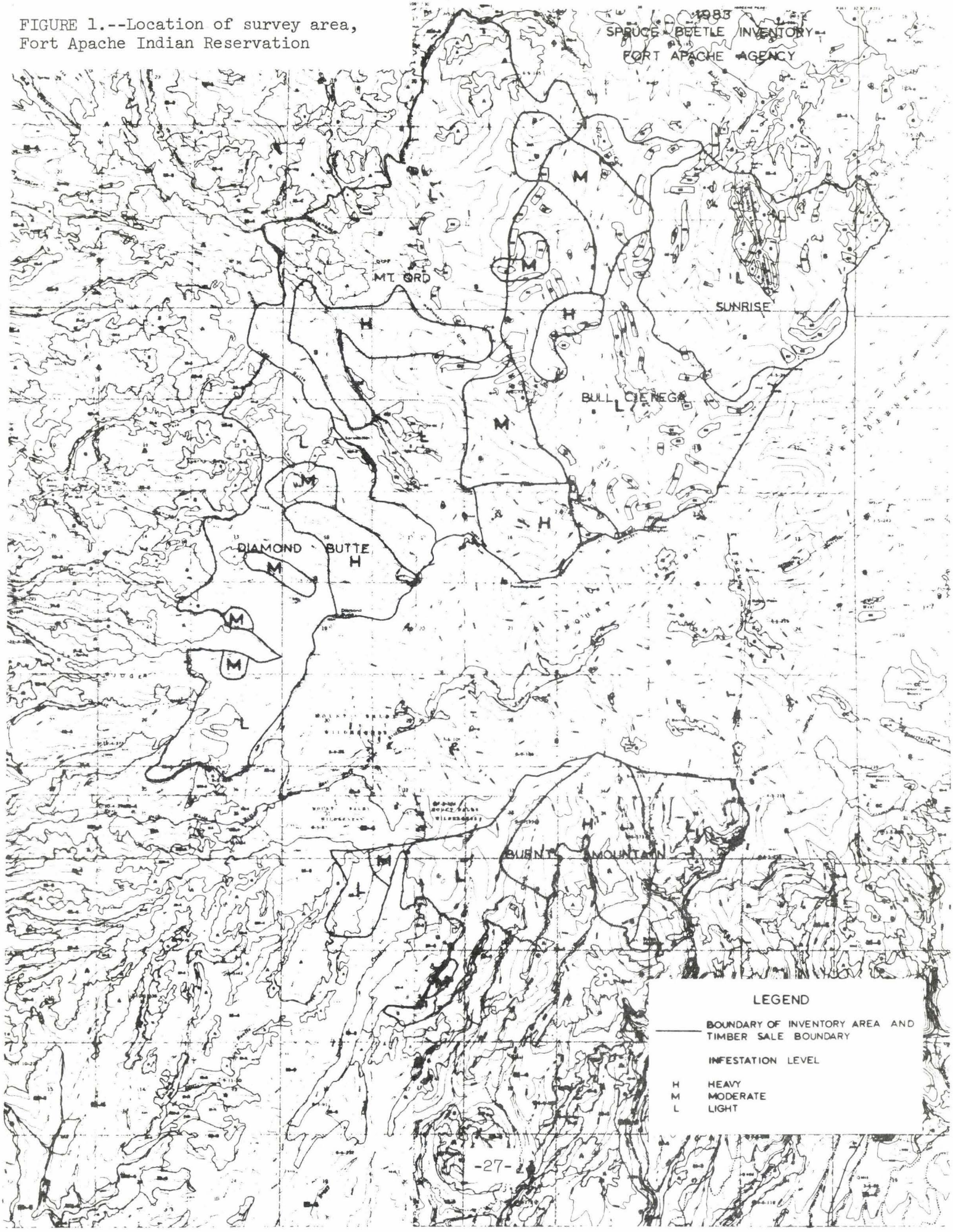


FIGURE 1.--Location of survey area, Fort Apache Indian Reservation

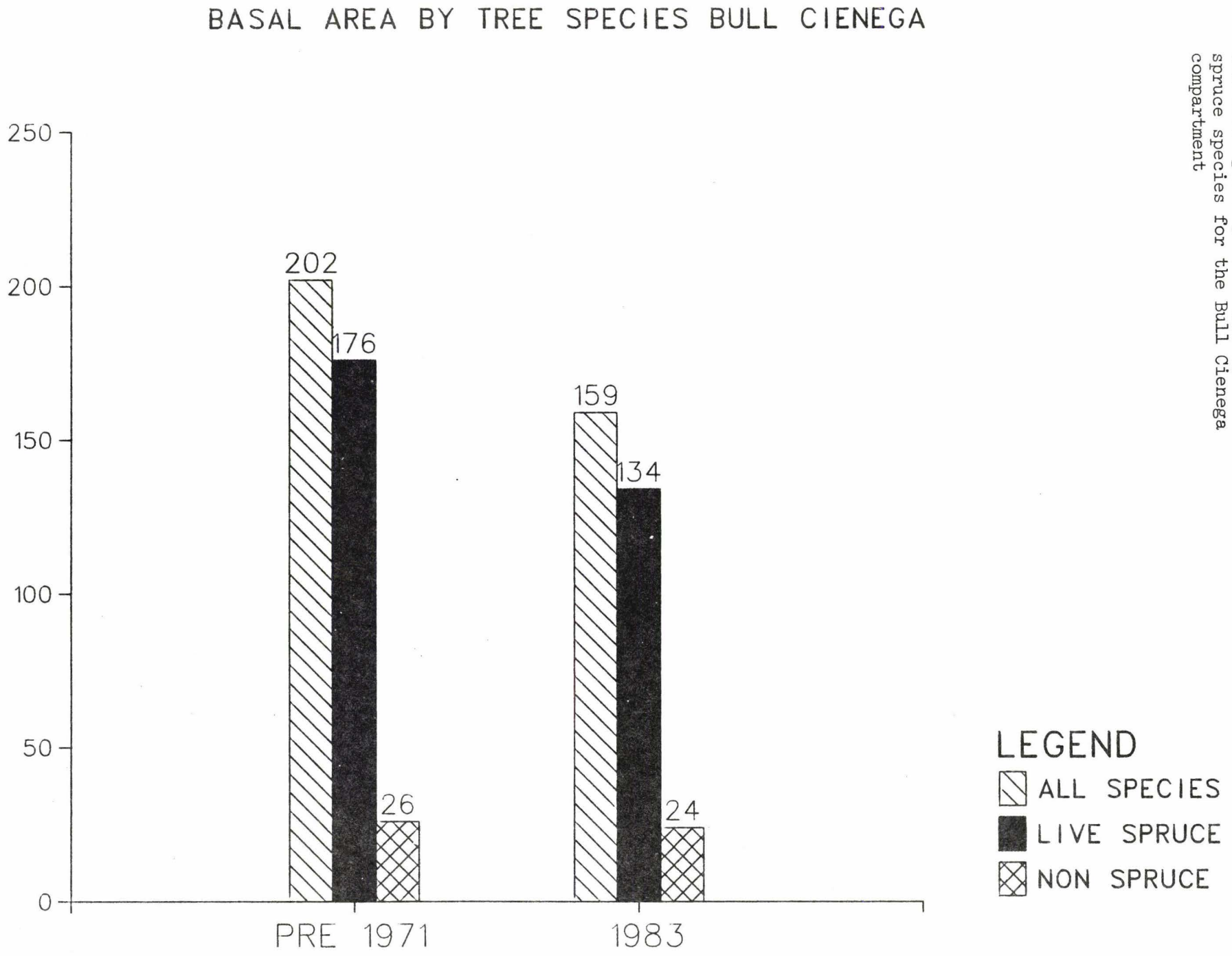


FIGURE 2.--Histogram of basal area by all tree species, live spruce, and non-spruce species for the Bull Cienega compartment

FIGURE 3.--Histogram of basal area by all tree species, live spruce, and non-spruce species for the Diamond Butte compartment

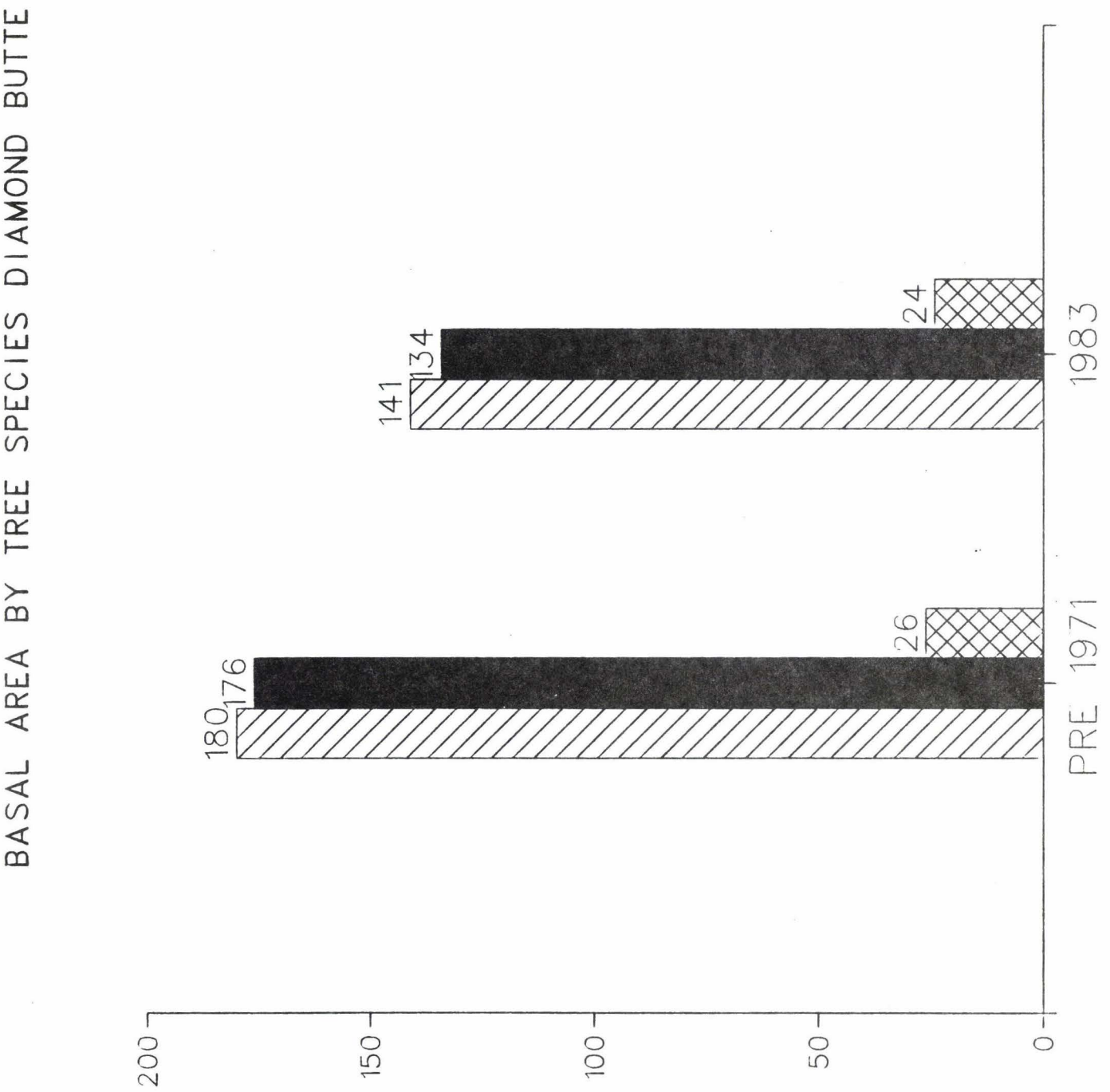

FIGURE 4.--Histogram of basal area by all tree species, live spruce, and non-spruce species for the Mt. Ord compartment